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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

KARACSONY, ROBERT

ART UNIT

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2821

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/565,598	Applicant(s) VAZQUEZ ET AL.	
	Examiner ROBERT KARACSONY	Art Unit 2821	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 23 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 January 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. The following Office Action is in response to the Amendments received November 13, 2009. Claims 1-9, 23 and 24 are currently pending.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “capacitive surface impedance of the first surface,” as claimed in independent claim 1, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Qiu et al.* (NPL Document, High-Directivity Patch Antenna with Both Photonic Bandgap Substrate and Photonic Bandgap Cover; 5 July 2001, hereinafter *Qiu*) in view of *Wilhelm et al.* (US 2003/0142036, hereinafter *Wilhelm*).

Claim 1: *Qiu* teaches a device for controlling electromagnetic radiation emitted by a structure, the device having a first surface (PGB cover shown in fig. 1) and a second reactive surface (PGB substrate shown in fig. 1) defining a cavity therebetween, and

an emitter (patch antenna shown in fig. 1) generating electromagnetic radiation between the first surface and the second reactive surface, wherein the electromagnetic radiation within the cavity is radiated into the air through the second reactive surface.

Qiu fails to explicitly teach the first surface is an equipotential surface and presents a capacitive surface impedance, and the second reactive surface comprises a lattice array of conductors disposed on a dielectric surface such that the displacement between a conductor and any other conductor adjacent to it is small compared to the wavelength of the electromagnetic radiation thereby causing the array of conductors to represent an effectively continuous conductive surface to the electromagnetic radiation, wherein a surface impedance of the second reactive surface is reactive. However, *Qiu* teaches that PGB structures can be a dielectric or a

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metallic periodic structure (see Part I. Introduction, lines 3-4). *Wilhelm* teaches various configurations of PGBs (see figs. 7, 9, 10 and 17), which include a lattice array of conductors disposed on a dielectric surface such that the displacement between a conductor and any other conductor adjacent to it is small compared to the wavelength of the electromagnetic radiation thereby causing the array of conductors to represent an effectively continuous conductive surface to the electromagnetic radiation. The claim would have been obvious because the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the PGB substrate and PGB cover of *Qiu* with the PGB structures of *Wilhelm* with a reasonable expectation of success, since the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Claim 2: *Qiu* teaches the dielectric surface is planar (fig. 1).

Claim 3: The modified invention of *Qiu* in view of *Wilhelm* teaches the electromagnetic radiation has more than one wavelength (paragraph [0012] of *Wilhelm*).

Claims 5-7: The modified invention of *Qiu* in view of *Wilhelm* teaches the surface impedance of the second reactive surface is inductive, capacitive, or the surface impedance of the second reactive surface is capacitive in some regions of the dielectric surface and inductive in the remaining regions of the dielectric surface (fig. 7 of *Wilhelm*).

Claim 8: The modified invention of *Qiu* in view of *Wilhelm* teaches the magnitude of the surface impedance of the second reactive surface varies at different positions on the dielectric surface (fig. 7 of *Wilhelm*).

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Claim 9: The modified invention of *Qiu* in view of *Wilhelm* teaches the conductors of the second reactive surface are substantially periodically disposed with respect to each other on the dielectric surface (fig. 7 of *Wilhelm*).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Qiu* in view of *Wilhelm* and *Sievenpiper et al.* (US 2003/0052834, hereinafter *Sievenpiper*).

Claim 4: The modified invention of *Qiu* in view of *Wilhelm* teaches all of the limitations of claim 1, as discussed above, however, fails to teach the electromagnetic radiation has more than one polarization. However, it was well known to the skilled artisan at the time of the invention to provide antenna systems with more than one polarization to enhance antenna reception. *Sievenpiper* teaches suitable antenna systems using high impedance surfaces comprising more than one polarization (fig. 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used more than one polarization with the antenna system of *Qiu*, as taught by *Sievenpiper*, in order to have enhanced the antenna reception.

6. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Legay* (US 6,927,729, hereinafter *Legay*) in view of *Qiu*.

Claims 1 and 5-9: *Legay* teaches a device for controlling electromagnetic radiation emitted by a structure, the device having a first surface (Ground, see fig. 4) and a second reactive surface (40, see fig. 1) defining a cavity therebetween, the first surface is an equipotential surface, and the second reactive surface comprises a lattice array of conductors (col. 5, lines 25-33) disposed on a dielectric surface such that the displacement between a conductor and any other conductor adjacent to it is small compared to the wavelength of the electromagnetic

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radiation thereby causing the array of conductors to represent an effectively continuous conductive surface to the electromagnetic radiation, wherein a surface impedance of the second reactive surface is reactive, and

an emitter (41, fig. 4) generating electromagnetic radiation between the first surface and the second reactive surface, wherein the electromagnetic radiation within the cavity is radiated into the air through the second reactive surface.

Legay fails to teach the first surface presents a capacitive surface impedance. However, *Qiu* teaches increasing the directivity by adding a PGB substrate (fig. 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the PGB substrate of *Qiu* with the ground of *Legay* in order to have increased the directivity of the antenna. Although figure 1 of *Qiu* teaches an aperture PGB, *Qiu* teaches PGB structures can be made by metallic periodic structures. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a PGB having a capacitive surface impedance, since it was known to make PGB structures out of metallic periodic structures.

Claim 2: *Legay* teaches the dielectric surface is planar (fig. 4).

Claim 3: *Legay* teaches the electromagnetic radiation has more than one wavelength (col. 5, line 62).

Claim 4: *Legay* teaches the electromagnetic radiation has more than one polarization (col. 5, lines 58-61).

7. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Legay* in view of *Qiu* and *Yamamoto et al.* (6,850,205, hereinafter *Yamamoto*).

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Claim 23: *Legay* teaches the cavity is formed using a printed circuit board substrate with the second reactive surface being printed on a top layer of the substrate and a bottom layer which forms the first surface as an opposite boundary (fig. 4). *Legay* fails to teach plated through holes forming the sides of the cavity. However, it was well known to the skilled artisan at the time of the invention to form conductive sides out of plated through holes. *Yamamoto* teaches conductive sidewalls can be replaced with plated through holes (figs. 43 and 46). The claim would have been obvious because the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the sidewalls of *Legay* with plated through holes, since the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Claim 24: *Legay* teaches the emitter is printed on an inner layer of the substrate (fig. 4).

Response to Arguments

8. Applicant's arguments filed November 13, 2009 have been fully considered but they are not persuasive.

9. Regarding the arguments that none of the cited prior art teaches a first surface that is equipotential, see page 6, line 16 through page 7, line 4 of the Remarks, the Examiner respectfully disagrees with Applicants. The Examiner notes that although none of the cited prior art uses the exact claim language of being "equipotential," that does not indicate that the PBG structures are not of equipotential. The PBG structures are in fact equipotential. With regards to *Qiu*, the PBG substrate isn't electrically connected to a power source, thus inherently equal to the

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same voltage. Secondly, with regards to *Wilhelm*, the conductive patches are all electrically connected to the same ground plane, thus they are all equal to the same electrical potential, see fig. 14.

10. Regarding the arguments that “*Qiu* aspires to use the stop band properties of PBG, while the present invention avoids the usage of resonant structures like PBG as the large electrical size of such PBG structures is undesirable,” see page 7, lines 5-16 of the Remarks, the Examiner respectfully disagrees with Applicants. The Examiner notes that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, since the claims are broad enough that they encompass PBG structures, the cited prior art reads on the claims. This reasoning also applies to the arguments regarding *Legay*.

11. Regarding the arguments that it is not obvious to combine the teachings of *Wilhelm* with the invention of *Qiu*, see page 8, lines 3-11 of the Remarks, the Examiner respectfully disagrees with Applicants. Firstly, *Qiu* teaches that the PBG structures are a dielectric or metallic periodic structures, see paragraph I – INTRODUCTION, lines 1-4. Therefore, *Qiu* invites various types of PBG structures, dielectric or metallic periodic structures, which are taught by *Wilhelm*. Secondly, it would have been an obvious substitution for the skilled artisan to have substituted the PBG structure of *Wilhelm* with the PBG structure of *Qiu*, since it would have yielded predictable results, such as altering the properties of electromagnetic waves that are reflected and/or transmitted from or through them.

12. Regarding the objections to the drawings, see page 10, paragraph 4 of the Remarks, the Examiner respectfully disagrees. The Examiner concedes that a "capacitive surface impedance"

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is a characteristic of the first surface. However, it must be a characteristic that is created by something. Examiner requires that Applicant clearly **illustrate and explain** what is causing the capacitive surface impedance. The only illustration presented in the instant application is a planar ground plane which in no way comprises a capacitive surface impedance, since capacitance is two conductors separated by a dielectric, and not a planar sheet of metal. The Examiner further requires Applicants to explain in the Written Description, or at least provide a citation of where such an explanation is already provided, what is causing the capacitive surface impedance of the first surface.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT KARACSONY whose telephone number is (571)270-1268. The examiner can normally be reached on M-F 7:30 am - 5:00 pm EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas W. Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. K./

Examiner, Art Unit 2821

/Hoang V Nguyen/

Primary Examiner, Art Unit 2821